

From: [Robert Maul](#)
To: [Sarah Fox](#); [Jan Coppola](#); [Phil Bourquin](#); [Curleigh \(Jim\) Carothers](#); [Lauren Hollenbeck](#)
Subject: Fwd:
Date: Tuesday, April 18, 2017 11:59:54 AM
Attachments: [Examiner Comments.pdf](#)
[ATT00001.htm](#)

FYI

Begin forwarded message:

From: "Randall B. Printz" <randy.printz@landerholm.com>
To: "Robert Maul" <RMaul@cityofcamas.us>, "Steve Wall" <SWall@cityofcamas.us>
Cc: "Rosenberg, Heidi" <Heidi.Rosenberg@camas.wednet.edu>, "kurt@olsonengr.com" <kurt@olsonengr.com>

Please place this email and its attachment from Kittelson into the record for the **Lacamas Heights Elementary School (CUP16-01)**. At the public hearing, Kurt Stonex, on behalf of the prospective purchasers (Holt Opportunity Fund II 2016 LP) of the Green Mountain Estates preliminarily approved subdivision, raised two issues before the Examiner. The first was that the Applicant was not complying with the applicable level of service requirements of the City of Camas and Clark County, with respect to the intersection of 232nd/28th. The evidence in the record at the time of the hearing supporting this allegation was the Applicant's traffic study which demonstrates that with trips added by the Applicant's project this intersection will fall below the adopted level of service established by the City and the County.

For some unknown reason, despite the Applicant's own traffic study demonstrating the regulatory requirement for mitigation at this intersection, the City's staff report did not recommend any mitigation at this intersection. The City's lack of a condition on this item could have been due to oversight, or based upon a letter from Clark County suggesting that mitigation might not be needed due to the small number of trips going through the movement that caused the intersection to fail. As is demonstrated by the attached analysis from Kittelson, the County's letter appears to either be based upon a misunderstanding of the number of trips utilizing the intersection, including the lane which is causing the failure; or a misunderstanding of the proper methodology for calculating the level of service at this intersection.

The attached letter from Kittelson makes clear that the number of trips that are using the failing lane, regardless of whether those trips are going straight or turning left, causes the intersection to fall below any adopted level of service in either the City or the County. The Kittelson letter identifies two alternative mitigation measures that would bring the Applicant's project into compliance. One of them was recommended

by the Applicant's own traffic engineering report.

Based upon the Applicant's traffic study and the attached letter from Kittelson, the Examiner should require that one or the other of the two mitigation measures recommended in the in the Kittlson letter be imposed as a condition of the Applicant's CUP.

The other issue that was raised at the hearing was whether the Applicant's traffic study included all of the required "in process" traffic. After having more time to analyze the Applicant's traffic study, we have found that the Applicant's traffic study did appropriately account for the applicable "in process" traffic.

Thank you for consideration of these issues.

Randall B. Printz | Attorney at Law



805 Broadway Street, Suite 1000

P.O. Box 1086

Vancouver, WA 98666-1086

T: 360-816-2524 | T: | F: 360-816-2525

www.landerholm.com

This e-mail message (including attachments) is for the sole use of the intended recipient(s). It contains confidential, proprietary or legally protected information which is the property of Landerholm, P.S. or its clients. Any unauthorized disclosure or use of the contents of this e-mail is strictly prohibited. If you have received this e-mail in error, notify the sender immediately and destroy all copies of the original message.

April 17, 2017

Project #: 21401

Mr. Joe Turner
City of Camas Hearings Examiner
625 NE 4th Avenue
Camas, WA 98607

RE: Lacamas Heights Elementary School (CUP16-01)

Dear Mr. Turner,

Please enter this letter into the public record for the Lacamas Heights Elementary School Conditional Use Permit (CUP16-01). At the request of Olson Engineering, we have reviewed the *Traffic Analysis Report for Lacamas Heights Elementary School* prepared by Charbonneau Engineering LLC and dated May 25, 2016 that supports the proposed CUP, as well as subsequent correspondence with Clark County Public Works staff on this matter.

Based on our review, we believe the May report correctly identified the need for mitigation of operations at the NE 28th Street/NE 232nd Avenue intersection. Correspondence between representatives of Charbonneau Engineering LLC and Clark County Public Works staff after completion of the traffic study further addresses intersection operations but it is unclear how the identified over-capacity condition at the intersection is consistent with County code requirements. As will be documented in this letter, we are unclear why mitigation of the intersection is not being addressed in the land use findings nor does it appear to be a required condition of approval for the school.

ANALYSIS

The May 25, 2016 *Traffic Analysis Report for Lacamas Heights Elementary School* (herein referred to as the "May 2016 traffic report") presents an analysis of future year 2018 traffic conditions at multiple intersections including NE 28th Street/NE 232nd Avenue. This report demonstrates that the northbound approach at the NE 28th Street/NE 232nd Avenue intersection requires mitigation. The key areas of the May 2016 traffic report related to this condition can be found in the following:

- Table 2, Capacity Analysis Summary, demonstrates that the northbound shared left/through/right approach operates at Level of Service F during the weekday AM and PM peak hours upon completion of the school. Table 2 also demonstrates that the northbound approach operates acceptably under the 2018 background condition (i.e., without the school).

- Text on page 5, paragraph 3 identifies and discusses a range of potential mitigation options to address the Level of Service F conditions, such as signalization or an added northbound left-turn lane.
- Text on page 5, final paragraph documents that a westbound left-turn lane is also warranted on at the intersection but adds that this lane is not recommended considering the operational results.
- After highlighting potential mitigation and turn lane warrant considerations, the report's "Summary and Recommendations" section identifies the need to add a second northbound lane to create separate left turn and combination through/right lanes on the approach (page 8, first paragraph).

The April 13, 2017 hearing record¹ contains two e-mails exchanged between Charbonneau Engineering and Clark County Public Works staff. The e-mail exchange was conducted in August 2016 subsequent to the May 2016 traffic report. It appears that Clark County staff concluded that no further analysis or mitigation of the NE 28th Street/NE 232nd Avenue intersection was required based on information provided by Charbonneau Engineering; however, based on the above, we are unclear how this conclusion was reached.

The August 19, 2016 e-mail prepared by Charbonneau Engineering includes information shown below in Exhibit 1.

¹ This material appears within Exhibit 7 - Traffic Study on pages 227 through 229 of the 748 page electronic PDF of the April 13 Hearing Examiners Packet

Exhibit 1. Excerpt from August 19, 2016 Email to Clark County Public Works

The traffic report dated 5/25/16 prepared for the Lacamas Heights Elementary School recently copied to you determined that the subject intersection would reach LOS 'F' for the year 2018 total traffic scenario unless mitigated by signalization. Code section 40.350.020(G)(1)(c) indicates that proposed developments shall not be required to mitigate their impacts in order to obtain concurrency approval unless meeting all three of the following:

1. The proposed development adds at least five (5) peak period trips to a failing intersection approach;
2. The projected volume to capacity ratio for the worst lane movement on the approach with the highest delay exceeds nine-tenths (0.9) during the peak traffic period; and
3. That same movement is worsened by the proposed development.

Stipulation #2 above pertaining to the volume to capacity (v/c) will not be met as the worst lane movement v/c (northbound left turn) remains below 0.9 in the peak hours. In fact the v/c equates to 0.58 for the year 2018 total traffic AM peak hour and 0.78 for the year 2018 total traffic PM peak hour. The ratios are summarized below using the LOS results contained in the traffic report for the new Lacamas Heights Elementary School.

Year 2018 Total, AM Peak Hour

Left Turn Demand = 178

Approach Capacity = 308

v/c = 0.58

Year 2018 Total, PM Peak Hour

Left Turn Demand = 214

Approach Capacity = 275

v/c = 0.78

Other supporting factors to consider for not mitigating the intersection include.

- Signalization is not warranted
- The proposed school will add only two vehicle trips to the northbound left turn movement in the AM peak hour and one trip in the PM peak hour.
- The City of Camas has identified a future TIF roadway and intersection project to install a roundabout at 232nd Avenue & 22nd Avenue. The future improvement will connecting to Ingle Road and lessen the traffic volume on the northbound approach of 232nd Avenue at 28th Street.
- The School District would have to obtain right-of-way to widen the intersection if the northbound approach were to add another travel lane.

Based on the findings listed in Exhibit 1, Charbonneau Engineering representatives recommend that "the County not require mitigation at the intersection of NE 232nd Avenue and NE 28th Street in conjunction with the Lacamas Heights Elementary School development project," despite the recommendations from the May 2016 Traffic Report to the contrary.

In an August 30, 2016 e-mail, Clark County staff responded to the August 19, 2016 e-mail and, amongst other items, concurs with the applicant's finding that only one (1) of the three (3) criterion in Clark County Code 41.350.020(G) are met at the intersection.

We have compared the findings of the August 19, 2016 e-mail (specifically those shown in Exhibit 1) with the May 2016 traffic report findings and are unclear how a finding can be made that Clark County Code 41.350.020(G)(1)(c) is satisfied.

Clark County Code 41.350.020(G)(1)(c) states:

All unsignalized intersections of regional significance in the unincorporated county shall achieve LOS E standards or better (if warrants are not met). If warrants are met, unsignalized

intersections of regional significance shall achieve LOS D standards or better. The signalization of unsignalized intersections shall be at the discretion of the Public Works Director and shall not obligate the county to meet this LOS standard. However, proposed developments shall not be required to mitigate their impacts in order to obtain a concurrency approval unless:

- (1) The proposed development adds at least five (5) peak period trips to a failing intersection approach;*
- (2) The projected volume to capacity ratio for the worst lane movement on the approach with the highest delay exceeds nine-tenths (0.9) during the peak traffic period; and*
- (3) That same movement is worsened by the proposed development.*

Reflecting on the requirements above, we offer the following elements for consideration:

- The Clark County Arterial Atlas classifies both NE 28th Street collector level facilities and, as a result, the intersection of the two roadways is of regional significance.
- The May 2016 traffic report clearly demonstrates that the northbound approach to the NE 28th Street/NE 232nd Avenue intersection is operating at Level of Service F only upon occupancy of the school. Under 2018 background conditions, the northbound approach meets County standards. As such, the data and analysis presented in the May 2016 traffic report appear to document that each of the three above criteria of 41.350.020(G)(1)(c) are met.
- Criteria 1 above states: (1) “The proposed development adds at least five (5) peak period trips to a failing *intersection approach*;
 - In the case of the northbound approach, there is one shared left/through/right lane today. Upon completion of the school, the northbound approach operates at level-of-service “F.” To our knowledge, the criteria does not provide for an applicant to separate out the turning movements in a shared lane situation and we would appreciate additional clarification on this issue.
 - The May 2016 traffic report Figure 4, Bus Trip Assignment, shows the proposed elementary school adds 15 northbound school bus trips (0 left-turn, 15 right-turns) to the failing northbound approach during the AM peak hour while Figure 6, Non-bus Trip Assignment, shows 100 trips (2 left-turns, 98 right-turns) added to the failing northbound approach. Together, the two figures indicate a total of 115 vehicle trips generated by the school are added to the failing northbound approach during the weekday AM peak hour, well in excess of the five-trip criteria cited in Clark County Code.

- May 2016 traffic report Figure 4, Bus Trip Assignment, shows the proposed elementary school adds 2 northbound school bus trips (0 left-turn, 2 right-turns) to the failing northbound approach during the PM peak hour while Figure 6, Non-bus Trip Assignment, shows 42 trips (1 left-turn, 41 right-turns) added by the school development to the failing northbound approach. Together, the two figures indicate a total of 44 vehicle trips are added to the failing northbound approach during the weekday PM peak hour, well in excess of the five-trip criteria cited in Clark County Code.
 - With 115 school site-generated vehicle trips added to the failing northbound approach in the weekday AM peak hour and 44 added during the weekday PM peak hour, Criteria 1 is met.
 - Exhibit 1, an excerpt of the August 19, 2016 e-mail, appears to conclude that the Criteria 1 is not met because “the proposed development will add only two vehicle trips to the northbound left turn movement in the AM peak hour and one trip in the PM peak hour”. While this statement corresponds with the May 2016 traffic report figures cited above, the County Code criteria refers to the failing *approach*, and, in the case of the intersection in question, there is only a single northbound lane so it is unclear why the northbound right-turns are excluded from the analysis.
- Criteria 2 states: (2) “The projected volume to capacity ratio for the worst lane movement on the approach with the highest delay exceeds nine-tenths (0.9) during the peak traffic period; and”
 - Our review findings:
 - The May 2016 traffic report technical appendix shows that the existing single lane northbound approach operates at a volume to capacity ratio of 1.017 during the weekday AM peak hour (refer to page 325 of the 748 page electronic April 13 Hearing Examiners Packet for the application).
 - The May 2016 traffic report technical appendix shows that the existing single lane northbound approach operates at a volume to capacity ratio of 0.981 during the weekday PM peak hour (refer to page 348 of the 748 page electronic April 13 Hearing Examiners Packet for the application).
 - Based on the technical analysis presented in the May 2016 traffic report, the single lane northbound approach volume to capacity ratio exceeds 0.90 during both the weekday AM and PM peak hours. Therefore Criteria 2 is met.

- Exhibit 1, an excerpt of the August 19, 2016 e-mail, appears to conclude that the volume to capacity ratio of a northbound left-turn lane would operate with a volume-to-capacity ratio below 0.90. The volume-to-capacity ratio analysis results shown in Exhibit 1 correspond with the *mitigated* intersection operations (refer to pages 335 and 358 of the 748 page electronic April 13 Hearing Examiners Packet for the application for the mitigated weekday AM and PM peak hour intersection operations). It is unclear why the volume to capacity ratios associated with a mitigated intersection assuming provision of a separate left-turn lane at the intersection are presented and then no mitigation is recommended to support the findings.
- Criteria 3 states: (3) That same movement is worsened by the proposed development.”
 - Our review findings:
 - Table 2, Capacity Analysis Summary, of the May 2016 traffic report demonstrates that the northbound intersection approach delay is worsened by the proposed development. The table demonstrates that the approach operates at LOS “E” under the background condition and “F” with the school. Therefore Criteria 3 is met.

Printed excerpts from the April 13 Hearing Examiners Packet are attached to this letter to ease review of our assessment.

Based on the review provided above, it appears that the mitigation measures would be necessary to satisfy Clark County Code 41.350.020(G)(1)(c) at the NE 28th Street/NE 232nd Avenue intersection consistent with the May 2016 traffic report recommendations. The August 2016 e-mail assessment and subsequent Clark County Public Works response appears to have been predicated on mitigated intersection analysis assuming provision of a northbound left-turn lane at the intersection.

Alternative Mitigation Measures to Consider

The May 2016 traffic report recommends construction of a separate northbound left-turn lane and demonstrates that provision of the turn lane would mitigate the proposed development impacts. We recognize that there are right-of-way limitations along NE 232nd Avenue and that the NE 28th Street/NE 232nd Avenue intersection is constrained, as cited in the August 19, 2016 e-mail.

Should further review by Clark County Public Works, City of Camas staff, and the applicant conclude that intersection mitigation is appropriate, we respectfully suggest that an alternative intersection mitigation option that could be considered (subject to approval by the respective transportation agencies) would be installation of a separate eastbound right-turn lane on NE 28th Street in lieu of a northbound left-turn lane.

NEXT STEPS

Thank you for the opportunity to comment on the application. We would be pleased to discuss any questions that you may have regarding our review.

Sincerely,
KITTELSON & ASSOCIATES, INC.



Chris Brehmer, P.E.
Principal Engineer

Cc: Kurt Stonex, P.E., Olson Engineering
Randy Printz, Landerholm Law Firm

Attachments: May 2016 traffic report excerpts



Jeremy Fick

From: Jardin, David <David.Jardin@clark.wa.gov>
Sent: Tuesday, August 30, 2016 9:52 AM
To: Frank Charbonneau; Curleigh (Jim) Carothers
Cc: Heidi.Rosenberg@Camas.wednet.edu; Chris Robertson; Jeremy Fick
Subject: RE: Lacamas Heights E.S. - 232nd Ave/28th St

Clark County Concurrency

The proposed development is required to meet the standards established in CCC 41.350.020(G) for corridors and intersections of regional significance. Typically, the County's transportation model is used to determine what urban area developments are currently being reviewed, approved, or are under construction and in the vicinity of the proposed development. The traffic these developments generate is referred to as "*in-process traffic*" and will ultimately contribute to the same roadway facilities as the proposed development. This "*in-process traffic*" is used to evaluate and anticipate area growth and its impact on intersection and roadway operating levels with and without the proposed development, helping to determine if roadway mitigation necessary to reduce transportation impacts.

Unsignalized Intersections

The applicant has submitted a traffic study that reports anticipated levels-of-service on the intersection of NE 28th Street/NE 232nd Avenue. This intersection was reported to have a level-of-service "F" on the stop controlled approach in the 2018 evaluation year with the proposed development. The applicant's traffic study also indicates that there are vehicle trips assigned to the failing approach in this intersection.

The applicant has provided an email (below) to supplement the submitted traffic study dated May 25, 2016. The supplemental email has analyzed the impacts of the proposed development on the intersection approaches, listed above, to determine if mitigation requirements would be warranted per CCC 40.350.020 (G)(1)(c).

The applicant's analysis compared the anticipated impacts against the criteria in the code section listed above and found that only one (1) of the three (3) criterion were met. Staff concurs with the applicant's findings.

The County has determined that this development can comply with adopted Concurrency Standards for unsignalized intersections.

SAFETY:

Mitigation for off-site safety deficiencies may only be a condition of approval on development in accordance with CCC 40.350.030(B)(6) The code states that "nothing in this section shall be construed to preclude denial of a proposed development where off-site road conditions are inadequate to provide a minimum level of service as specified in Section 40.350.020 or a *significant* traffic or safety hazard *would be caused or materially aggravated* by the proposed development; provided, that the applicant may voluntarily agree to mitigate such direct impacts in accordance with the provisions of RCW 82.02.020."

Crash History

The applicant's traffic study analyzed the crash history as obtained from Washington State Department of Transportation (WSDOT) for the period 2010 through 2014.

The intersection crash rates, for the study intersection did not exceed thresholds that would warrant additional analysis. However, Staff did review the reported crash at the intersection of NE 28th Street/NE 232nd Avenue to understand the crash type. Staff's review found that the crash was due to an animal in the roadway.

The applicant's study did not recommend any safety mitigations as a part of this development. Staff concurs with the applicant's finding.

Based on Staff's review of the applicant's materials, no further analysis or mitigation is required. Thank you for the opportunity to comment.

David Jardin
Concurrency Engineer
360-397-6118 ext. 4354

From: Frank Charbonneau [mailto:Frank@CharbonneauEngineer.com]
Sent: Friday, August 19, 2016 3:42 PM
To: Jardin, David
Subject: Lacamas Heights E.S. - 232nd Ave/28th St

David – As discussed this morning I am documenting the pertinent code section and the associated requirements for concurrency approval related to the intersection conditions for NE 232nd Avenue and 28th Street in Clark County.

The traffic report dated 5/25/16 prepared for the Lacamas Heights Elementary School recently copied to you determined that the subject intersection would reach LOS 'F' for the year 2018 total traffic scenario unless mitigated by signalization. Code section 40.350.020(G)(1)(c) indicates that proposed developments shall not be required to mitigate their impacts in order to obtain concurrency approval unless meeting all three of the following:

1. The proposed development adds at least five (5) peak period trips to a failing intersection approach;
2. The projected volume to capacity ratio for the worst lane movement on the approach with the highest delay exceeds nine-tenths (0.9) during the peak traffic period; and
3. That same movement is worsened by the proposed development.

Stipulation #2 above pertaining to the volume to capacity (v/c) will not be met as the worst lane movement v/c (northbound left turn) remains below 0.9 in the peak hours. In fact the v/c equates to 0.58 for the year 2018 total traffic AM peak hour and 0.78 for the year 2018 total traffic PM peak hour. The ratios are summarized below using the LOS results contained in the traffic report for the new Lacamas Heights Elementary School.

Year 2018 Total, AM Peak Hour

Left Turn Demand = 178

Approach Capacity = 308

v/c = 0.58

Year 2018 Total, PM Peak Hour

Left Turn Demand = 214

Approach Capacity = 275

v/c = 0.78

Other supporting factors to consider for not mitigating the intersection include.

- Signalization is not warranted
- The proposed school will add only two vehicle trips to the northbound left turn movement in the AM peak hour and one trip in the PM peak hour.
- The City of Camas has identified a future TIF roadway and intersection project to install a roundabout at 232nd Avenue & 22nd Avenue. The future improvement will connecting to Ingle Road and lessen the traffic volume on the northbound approach of 232nd Avenue at 28th Street.
- The School District would have to obtain right-of-way to widen the intersection if the northbound approach were to add another travel lane.

Based on these considerations it is recommended the County not require mitigation at the intersection of NE 232nd Avenue and 28th street in conjunction with the Lacamas Heights Elementary School development project.

We would appreciate receiving your input regarding this recommendation as soon as possible. At that point we would provide the findings to the City of Camas for review.

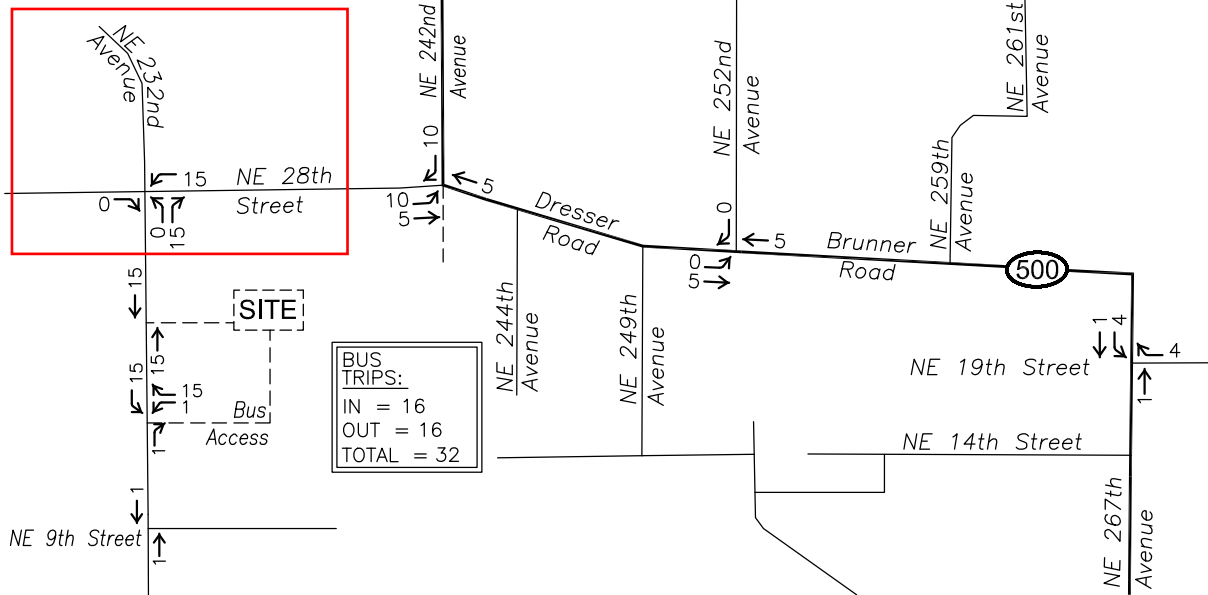
Please do not hesitate to contact me if you have any questions.

Frank Charbonneau, PE, PTOE
Charbonneau Engineering
503.293.1118

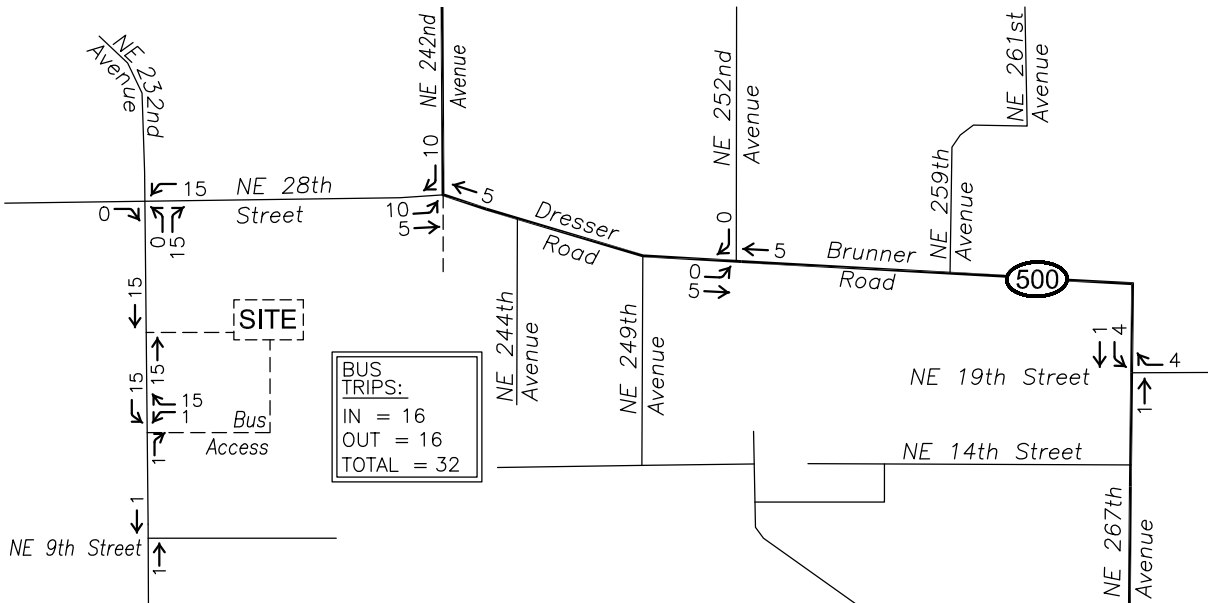
This e-mail and related attachments and any response may be subject to public disclosure under state law.

FILE NAME: 1546flow2.dwg

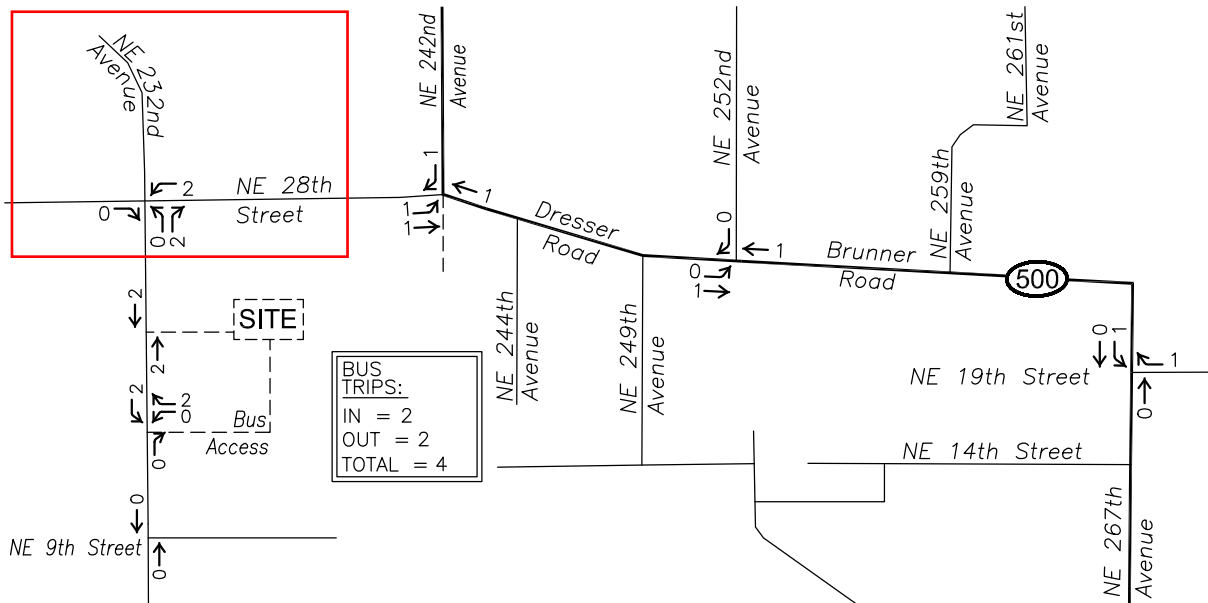
PLOT DATE: 05.14.16



AM
PEAK
HOUR



MID-
AFTERNOON
PEAK
HOUR



PM
PEAK
HOUR



CHARBONNEAU
ENGINEERING LLC

PROJECT: 15-46

NOTES: The proposed enrollment will be served by 12 long buses and 4 short buses (16 buses total).

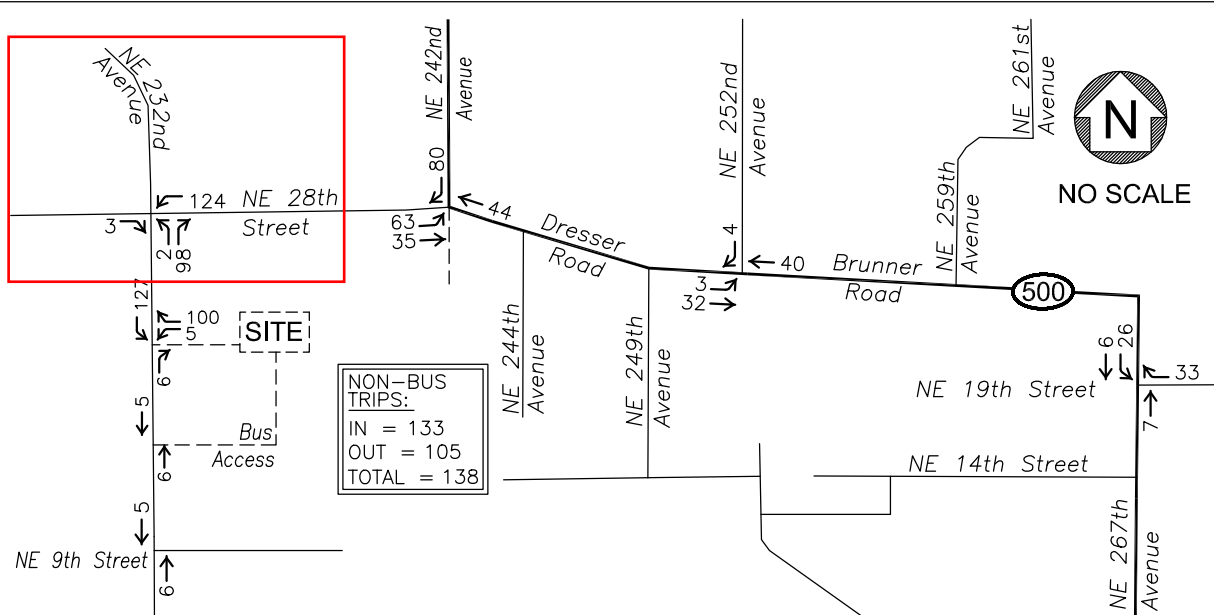
BUS TRIP ASSIGNMENT
LACAMAS HEIGHTS
ELEMENTARY SCHOOL

FIGURE

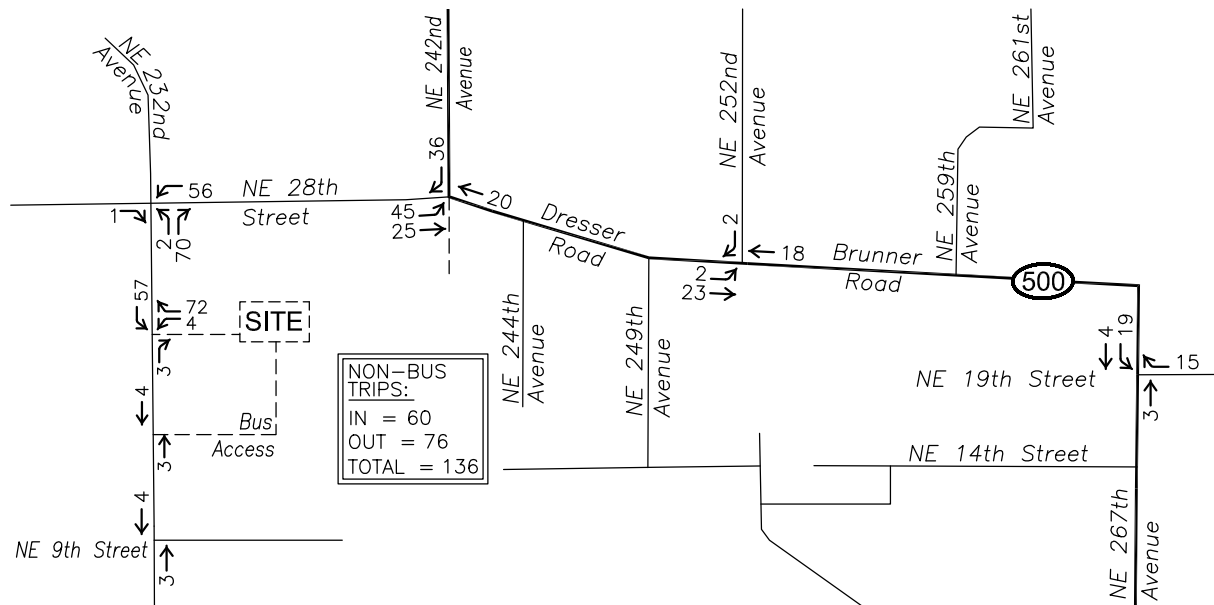
4

FILE NAME: 1546flow2.dwg

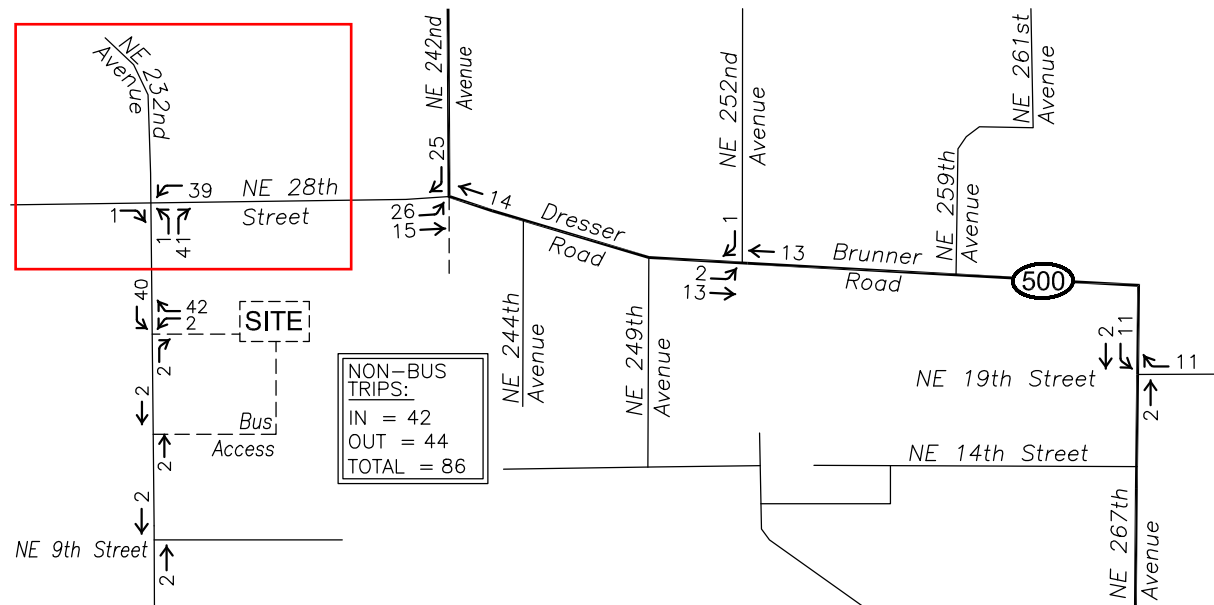
PLOT DATE: 05.14.16



AM
PEAK
HOUR



MID-
AFTERNOON
PEAK
HOUR



PM
PEAK
HOUR

HCM 2010 TWSC

2018 Total Traffic (232nd Access analysis), AM Peak Hour

3: NE 232nd Avenue & NE 28th Street

5/15/2016

Intersection												
Int Delay, s/veh	26.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	0	169	165	151	295	0	162	0	124	0	0	4
Future Vol, veh/h	0	169	165	151	295	0	162	0	124	0	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Yield	Yield	Yield
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	3	3	3	1	1	1	4	4	4	0	0	0
Mvmt Flow	0	186	181	166	324	0	178	0	136	0	0	4
Major/Minor	Major1			Major2			Minor1					
Conflicting Flow All	324	0	0	367	0	0	932	932	276			
Stage 1	-	-	-	-	-	-	276	276	-			
Stage 2	-	-	-	-	-	-	656	656	-			
Critical Hdwy	4.13	-	-	4.11	-	-	7.14	6.54	6.24			
Critical Hdwy Stg 1	-	-	-	-	-	-	6.14	5.54	-			
Critical Hdwy Stg 2	-	-	-	-	-	-	6.14	5.54	-			
Follow-up Hdwy	2.227	-	-	2.209	-	-	3.536	4.036	3.336			
Pot Cap-1 Maneuver	1230	-	-	1197	-	-	245	264	758			
Stage 1	-	-	-	-	-	-	726	678	-			
Stage 2	-	-	-	-	-	-	451	459	-			
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1230	-	-	1197	-	-	213	219	758			
Mov Cap-2 Maneuver	-	-	-	-	-	-	213	219	-			
Stage 1	-	-	-	-	-	-	726	678	-			
Stage 2	-	-	-	-	-	-	375	381	-			
Approach	EB			WB			NB					
HCM Control Delay, s	0			2.9			93.6					
HCM LOS							F					
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR					
Capacity (veh/h)	309	1230	-	-	1197	-	-					
HCM Lane V/C Ratio	1.017	-	-	-	0.139	-	-					
HCM Control Delay (s)	93.6	0	-	-	8.5	0	-					
HCM Lane LOS	F	A	-	-	A	A	-					
HCM 95th %tile Q(veh)	11.2	0	-	-	0.5	-	-					

HCM 2010 TWSC

2018 Total Traffic (232nd Access analysis), PM Peak Hour

3: NE 232nd Avenue & NE 28th Street

5/15/2016

Intersection												
Int Delay, s/veh	20.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	5	384	197	55	242	0	199	0	52	0	0	2
Future Vol, veh/h	5	384	197	55	242	0	199	0	52	0	0	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Yield	Yield	Yield
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	0	0	3	3	3	0	0	0	0	0	0
Mvmt Flow	5	413	212	59	260	0	214	0	56	0	0	2
Major/Minor	Major1			Major2			Minor1					
Conflicting Flow All	260	0	0	625	0	0	908	908	519			
Stage 1	-	-	-	-	-	-	530	530	-			
Stage 2	-	-	-	-	-	-	378	378	-			
Critical Hdwy	4.1	-	-	4.13	-	-	7.1	6.5	6.2			
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-			
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-			
Follow-up Hdwy	2.2	-	-	2.227	-	-	3.5	4	3.3			
Pot Cap-1 Maneuver	1316	-	-	952	-	-	258	277	561			
Stage 1	-	-	-	-	-	-	536	530	-			
Stage 2	-	-	-	-	-	-	648	619	-			
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1316	-	-	952	-	-	243	256	561			
Mov Cap-2 Maneuver	-	-	-	-	-	-	243	256	-			
Stage 1	-	-	-	-	-	-	533	527	-			
Stage 2	-	-	-	-	-	-	601	574	-			
Approach	EB			WB			NB					
HCM Control Delay, s	0.1			1.7			90.1					
HCM LOS							F					
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR					
Capacity (veh/h)	275	1316	-	-	952	-	-					
HCM Lane V/C Ratio	0.981	0.004	-	-	0.062	-	-					
HCM Control Delay (s)	90.1	7.7	0	-	9	0	-					
HCM Lane LOS	F	A	A	-	A	A	-					
HCM 95th %tile Q(veh)	9.7	0	-	-	0.2	-	-					

HCM 2010 TWSC

3: NE 232nd Avenue & NE 28th Street

2018 Total-MIT w NB LT, AM Peak Hour

5/18/2016

Intersection

Int Delay, s/veh 13.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	0	169	165	151	295	0	162	0	124	0	0	4
Future Vol, veh/h	0	169	165	151	295	0	162	0	124	0	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Yield	Yield	Yield
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	3	3	3	1	1	1	4	4	4	0	0	0
Mvmt Flow	0	186	181	166	324	0	178	0	136	0	0	4

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	324	0	0	367	0	0	932	932	276
Stage 1	-	-	-	-	-	-	276	276	-
Stage 2	-	-	-	-	-	-	656	656	-
Critical Hdwy	4.13	-	-	4.11	-	-	7.14	6.54	6.24
Critical Hdwy Stg 1	-	-	-	-	-	-	6.14	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.14	5.54	-
Follow-up Hdwy	2.227	-	-	2.209	-	-	3.536	4.036	3.336
Pot Cap-1 Maneuver	1230	-	-	1197	-	-	245	264	758
Stage 1	-	-	-	-	-	-	726	678	-
Stage 2	-	-	-	-	-	-	451	459	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1230	-	-	1197	-	-	213	219	758
Mov Cap-2 Maneuver	-	-	-	-	-	-	213	219	-
Stage 1	-	-	-	-	-	-	726	678	-
Stage 2	-	-	-	-	-	-	375	381	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.9	45.9
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	213	758	1230	-	-	1197	-	-
HCM Lane V/C Ratio	0.836	0.18	-	-	-	0.139	-	-
HCM Control Delay (s)	72.8	10.8	0	-	-	8.5	0	-
HCM Lane LOS	F	B	A	-	-	A	A	-
HCM 95th %tile Q(veh)	6.3	0.7	0	-	-	0.5	-	-

HCM 2010 TWSC

2018 Total Traffic-MIT w NB LT, PM Peak Hour

3: NE 232nd Avenue & NE 28th Street

5/18/2016

Intersection

Int Delay, s/veh 14.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	5	384	197	55	242	0	199	0	52	0	0	2
Future Vol, veh/h	5	384	197	55	242	0	199	0	52	0	0	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Yield	Yield	Yield
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	0	0	3	3	3	0	0	0	0	0	0
Mvmt Flow	5	413	212	59	260	0	214	0	56	0	0	2

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	260	0	0	625	0	0	908	908	519
Stage 1	-	-	-	-	-	-	530	530	-
Stage 2	-	-	-	-	-	-	378	378	-
Critical Hdwy	4.1	-	-	4.13	-	-	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.227	-	-	3.5	4	3.3
Pot Cap-1 Maneuver	1316	-	-	952	-	-	258	277	561
Stage 1	-	-	-	-	-	-	536	530	-
Stage 2	-	-	-	-	-	-	648	619	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1316	-	-	952	-	-	243	256	561
Mov Cap-2 Maneuver	-	-	-	-	-	-	243	256	-
Stage 1	-	-	-	-	-	-	533	527	-
Stage 2	-	-	-	-	-	-	601	574	-

Approach	EB	WB	NB
HCM Control Delay, s	0.1	1.7	61.3
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	243	561	1316	-	-	952	-	-
HCM Lane V/C Ratio	0.881	0.1	0.004	-	-	0.062	-	-
HCM Control Delay (s)	74.1	12.1	7.7	0	-	9	0	-
HCM Lane LOS	F	B	A	A	-	A	A	-
HCM 95th %tile Q(veh)	7.3	0.3	0	-	-	0.2	-	-